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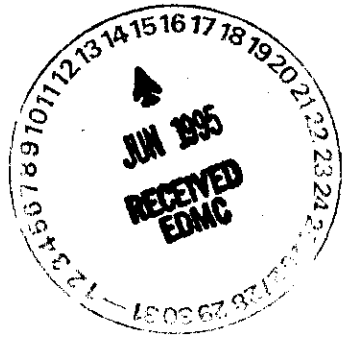
DOE/RL-94-20
Rev. 0

Pickling Acid Cribs Remedial Investigation/ Feasibility Study

United States
Department of Energy
Richland, Washington



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EXECUTIVE SUMMARY

The Environmental Protection Agency (EPA) and the Washington State Department of Ecology (Ecology) recommended in a letter dated March 4, 1992 that the Department of Energy (DOE) prepare an expedited response action (ERA) for the White Bluffs Pickling Acid Cribs Site. The lead regulatory agency for the ERA is the EPA; Ecology is the supporting agency. The ERA characterization activities were conducted in November 1992 and follow applicable sections of 40 CFR 300, Subpart E (EPA 1990), the *Hanford Federal Facility Agreement and Consent Order*, *Comprehensive Environmental Response Compensation and Liability Act* (CERCLA), the *Resource Conservation and Recovery Act of 1976* (RCRA); and the *State of Washington Model Toxics Control Act.*

The 100-IU-5 Operable Unit contains only the White Bluffs Pickling Acid Cribs source (soil) zone. The groundwater will be investigated as part of the 100-IU-2 Operable Unit. The two cribs are south of the White Bluffs Town Site in the 600 Area located at the Hanford Site. The cribs are side by side and are each about 61 meters by 15 meters (200 feet by 50 feet). The White Bluffs Area was the location of construction activities from about 1943 to 1959. After construction activity terminated, all of the White Bluff construction support facilities were torn down. Little is known about crib activities during the years of construction..

This remedial investigation/feasibility study (RI/FS) report is organized in a format similar to the *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, Interim Final Manual* (EPA 1988). This RI/FS report does not include evaluations of cleanup alternatives because there is no site contamination.

During the characterization activities, soil samples were collected at the surface basin adjacent to the crib site. The basin is not in the 100-IU-5 Operable Unit. This report includes risk assessment information and data on the surface basin for information and documentation purposes only.

The ERA characterized the site using historical research, visual site surveys, radiological surveys, ground penetrating radar, electromagnetic induction surveys, and soil sampling. Based on the characterization activities and Hanford Site background levels, there is no radiological contamination. Only one detected nonradioactive element (zinc) had readings above background.

The maximum detected zinc concentration was in one centralized spot adjacent to an underground pipe. The elevated concentration is attributed to the scrapping of a galvanized pipe at this location during ERA characterization activities. Nevertheless, zinc was carried through the human health and ecological risk assessments. The maximum zinc concentration detected at the site was 554 mg/kg, which is well below the most restricted zinc soil concentration (2,400 mg/kg) in the human health risk-based screening. Therefore, zinc was eliminated from further analysis.

The ecological risk assessment considered the maximum detected zinc concentration to be relatively nontoxic. Both the human health and ecological risk assessments eliminated zinc as a contaminant of concern.

Since there is no site contamination, there is no reason to evaluate cleanup alternatives. This RI/FS supports a no action alternative.

LIST OF ACRONYMS

ARAR	applicable or relevant and appropriate requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
COPC	contaminants of potential concern
DOE	U.S. Department of Energy
DOE-RL	U.S. Department of Energy-Richland Field Office
DQO	data quality objective
Ecology	Washington State Department of Ecology
EMI	electromagnetic surveys
EPA	U.S. Environmental Protection Agency
ER	environmental restoration
ERA	expedited response action
ERE	Environmental Restoration Engineering
FS	feasibility study
GM	Geiger-Muller probe
GPR	ground-penetrating radar
HEIS	Hanford Environmental Information System
HFSUWG	Hanford Future Site Uses Working Group
HSBRAM	Hanford Site Baseline Risk Assessment Methodology
HSWA	Hazardous and Solid Waste Amendments (of 1984)
HEAST	Health Effects Assessment Summary Tables
HQ	hazard quotient
ICR	incremental cancer risk
IRIS	Integrated Risk Information System
IRM	interim remedial measure
IU	isolated unit
LFI	limited field investigation
MCL	maximum contaminant level
MTCA	Model Toxics Control Act
MTCACR	Model Toxics Control Act Cleanup Regulations
NA	not applicable
NCP	National Oil and Hazardous Substances Contingency Plan
NR	not reported
NPL	National Priorities List
OU	Operable Unit
PEF	Particulate Factor
QA	Quality Assurance
QC	Quality Control
RCRA	Resource Conservation and Recovery Act of 1976
RfD	reference dose
RI	remedial investigation
ROD	record of decision

LIST OF ACRONYMS (cont.)

SF	slope factor
TAL	Target Analyte List
TBC	to be considered
TCL	Target Compound List
TOC	total organic carbon
TSD	treatment storage and disposal
UCL	upper confidence limit
UTL	upper tolerance limit
WAC	Washington Administrative Code

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1.0 INTRODUCTION

The Environmental Protection Agency (EPA) and the Washington State Department of Ecology (Ecology) recommended in a letter dated March 4, 1992 (Appendix B) that the U.S. Department of Energy (DOE) prepare an Expedited Response Action (ERA) for the White Bluffs Pickling Acid Cribs Site Location (Figure 1). The lead regulatory agency for this ERA is the EPA; Ecology is the supporting agency. The ERA characterization activities were conducted in November 1992 and followed applicable sections of 40 CFR 300, Subpart E; the *Hanford Federal Facility Agreement and Consent Order*, the *Comprehensive Environmental Response, Compensation and Liability Act of 1980* (CERCLA); the *Resource Conservation and Recovery Act of 1976* (RCRA); and the Washington State *Model Toxics Control Act* (MTCA).

The White Bluffs Pickling Acid Cribs Site location is in the 600 Area near the 100-F Area. The cribs are the only surface soil waste site within the 100-IU-5 Operable Unit (Figures 1 and 2). The groundwater will be investigated as part of the 100-IU-2 Operable Unit. An ERA was performed with the goal of reducing the potential of any residual contaminant migration from the cribs to the soil column and groundwater.

1.1 PURPOSE

This report follows the Hanford Site past-practice remedial investigation/feasibility study (RI/FS) process to ultimately lead to the issuance of a record of decision (ROD) and closure of the operable unit. Figure 3 illustrates a flowchart of this particular ERA path leading to the final remedy selection for the operable unit.

1.2 BACKGROUND INFORMATION

1.2.1 Site Description

The White Bluffs Pickling Acid Cribs Site, which is south of the White Bluffs town site in the 600 Area, is the only site identified in the 100-IU-5 Operable Unit. The White Bluffs Area was the location of construction activities from about 1943 to 1959. After construction activity terminated, the White Bluffs construction support facilities were torn down. Other than the historical information obtained in the *Hanford Site Waste Management Unit Reports* (DOE-RL 1992), little is known about activities conducted at the site. It is believed that the cribs received waste streams (primarily nitric and hydrofluoric acid etch solutions) from a pipe fabrication facility that operated sometime between 1943 and 1959. The pipe fabrication facility location is suspected to be northeast of the cribs in the 100-IU-2 Operable Unit.

There are two parallel pickling acid cribs at the site. Each crib is an excavated trench filled with exposed gravel and is about 61 meters (m) by 15 m (200 ft by 50 ft).

Figure 1. Location of the White Bluffs Pickling Acid Cribs.

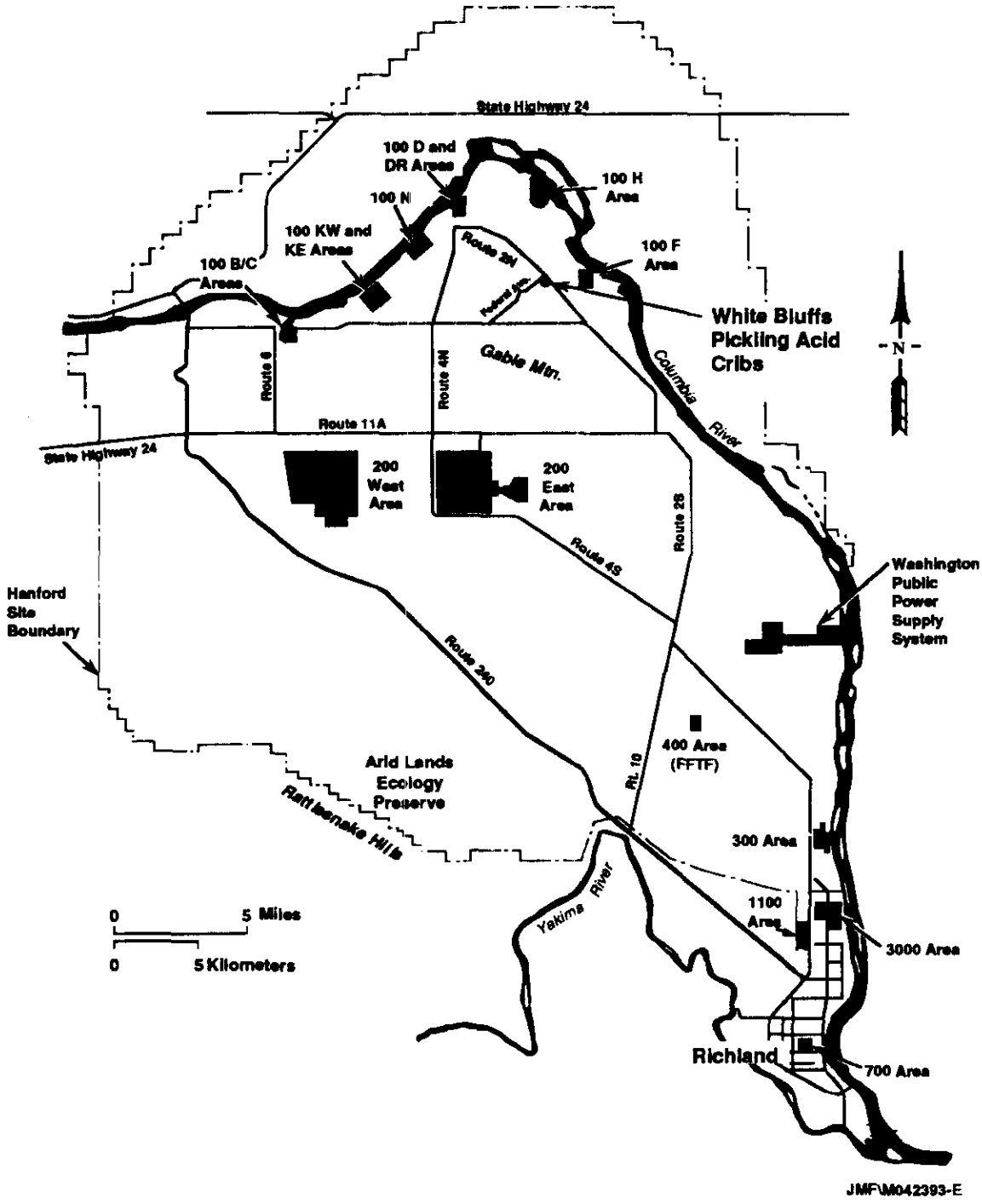


Figure 2. Location of the 100-IU-2 and 100-IU-5 Operable Units.

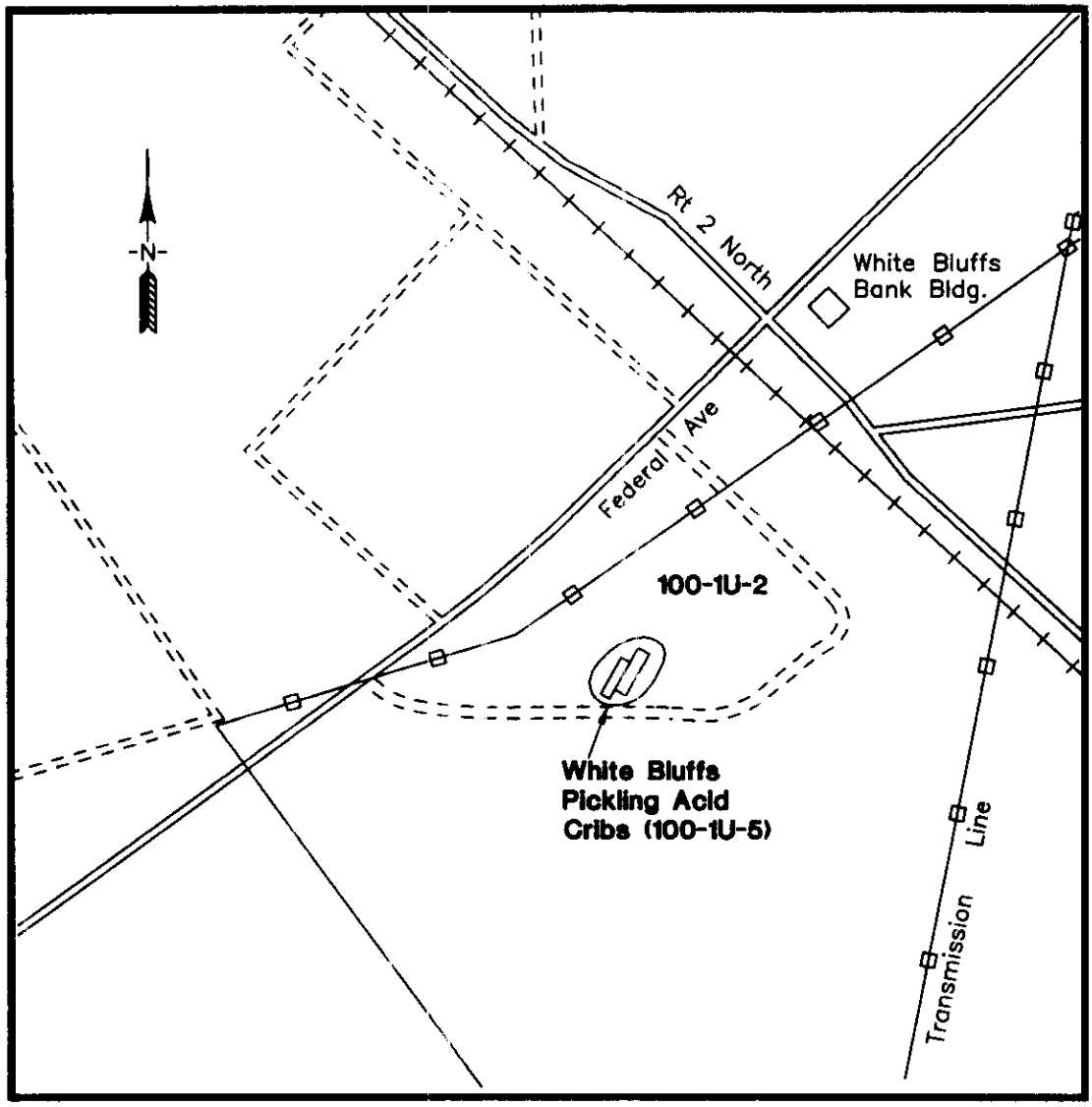
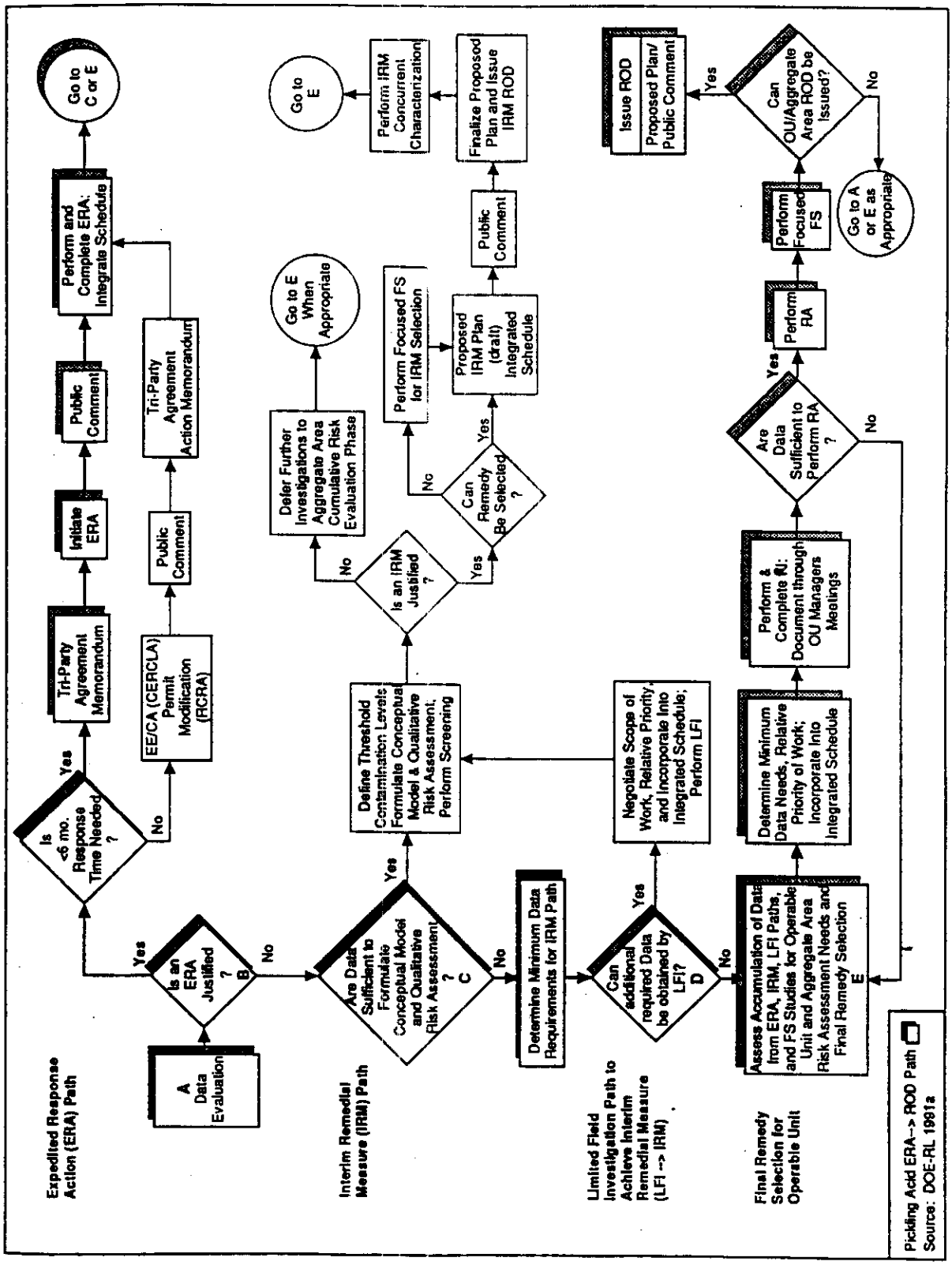


Figure 3. Hanford Past-Practice ERA and RI/FS Process for the 100-IU-5 Pickling Acid Cribs.



Each crib contained three evenly spaced rows of vent pipes, spaced 2 m to 3 m (7 ft to 9 ft) apart, which protruded from the cobbled surface and ran the length of each crib. A riser pipe, about 1 m (36-in.) diameter, protruded from the northern end of the west crib. This pipe was removed during an investigation to obtain samples of soil beneath it. The cribs were fed by underground pipelines suspected to come from the northeast (Figures 4 through 6). Northeast of the cribs are areas that appear to have been disturbed. The area debris indicates the possible presence of a landfill and/or building demolition areas. In addition, southeast of the cribs is another area that appears to have been disturbed. This area is a depression about 85 m by 40 m (280 ft by 130 ft). It is believed to have been a surface basin (as it will be referred to in this document). Both of these disturbed areas are part of the 100-IU-2 Operable Unit.

1.2.2 Site History

Minimal historical data exist regarding the use of the White Bluffs Pickling Acid Cribs. Available information indicates only that the pickling process used "several thousand gallons of acid" (DOE-RL 1992). This volume is believed to be a 9-12% acid in an acid etch aqueous solution (probably nitric and hydrofluoric acids). While this information is not specific regarding quantities or acid type, it was useful in narrowing the constituents of concern to acids and metal pipe etching byproducts.

1.2.3 Nature and Extent of Contamination

The nature and extent of potential soil contamination was determined by surface and intrusive soil samples collected in November 1992. Surface sampling consisted of collecting soil samples to a depth of 0.3 m (1 ft) or less. Intrusive soil samples came from test pits at depths to 4 m (16 ft) below the surface. Samples were taken at 0 m (0 ft) and 1.5 m (5 ft) beneath the soil cobble interface. The test pits were also used to verify the configuration of the piping system and to allow a visual inspection of the crib construction. The excavated material (soil, cobbles) were returned to the cribs after the samples were collected.

Table A-1 in Appendix A details the soil samples, location, and analysis. Figure 6 maps the sampling locations. Sample results are presented and validated in the *White Bluffs Pickling Acid Cribs Expedited Response Action Data Validation Report* (WHC 1993a).

The sampling effort investigated the cribs' feeder pipes ("C" samples in Figure 6) and a depression (the surface basin) on the southeastern corner of the eastern crib ("D" samples on Figure 6). The sample results are provided in Tables A-2 and A-3 in Appendix A.

The contamination from the cribs is defined by a step-wise screening process explained in the risk assessment section (Section 2.0). Chemical constituents detected in soil were compared to levels observed in sample blanks, established background concentrations, and calculated risk-based screening levels. The goal was to identify those compounds that constitute actual contamination and may pose a risk to human health and the environment. The compounds defined in this process were designated contaminants of potential concern (COPC). The baseline health and ecological risk assessments used the COPCs

Figure 4. GPR Report Pipe Layout.

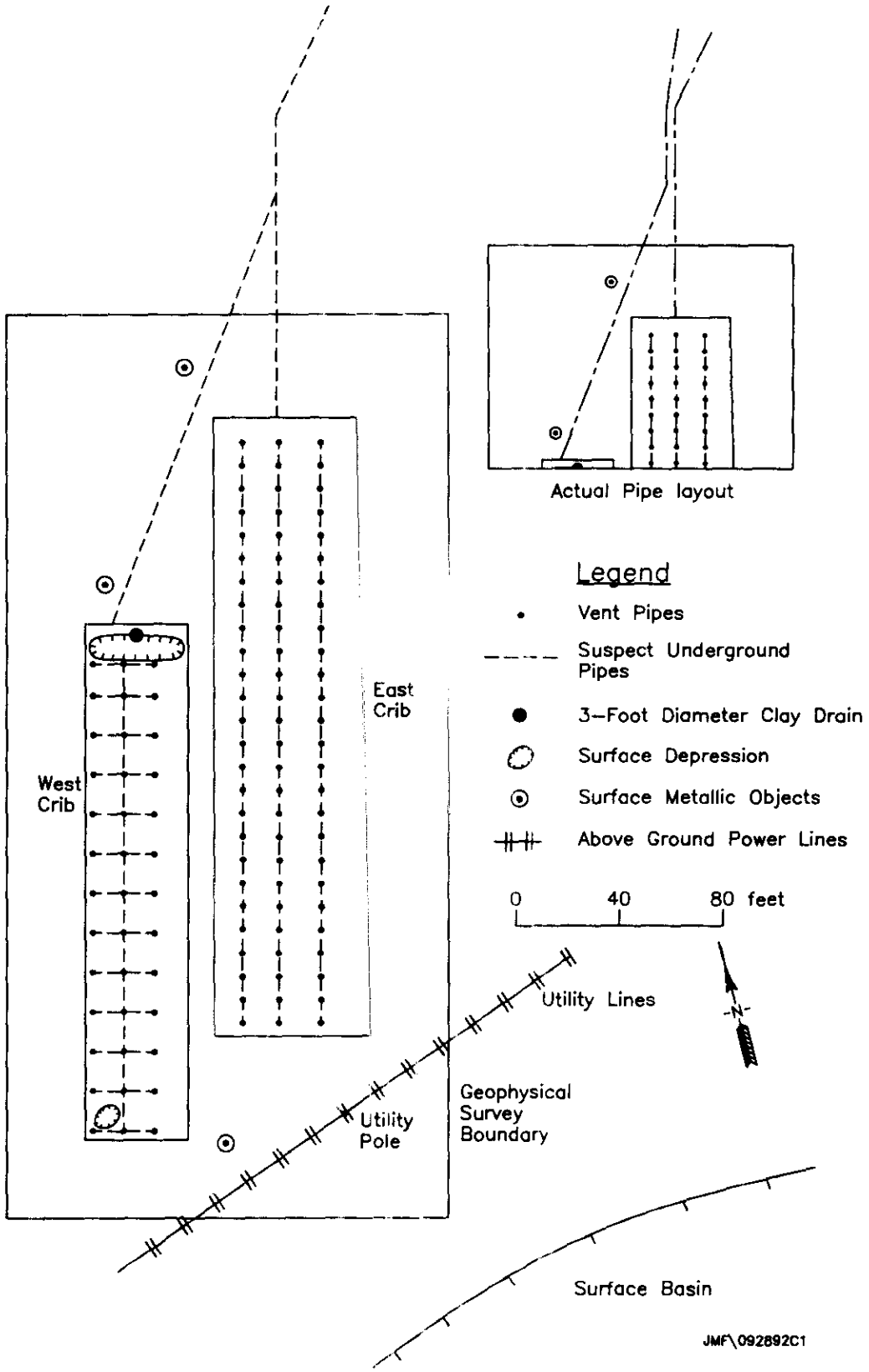


Figure 5. Plan and Sections Through Cribs.

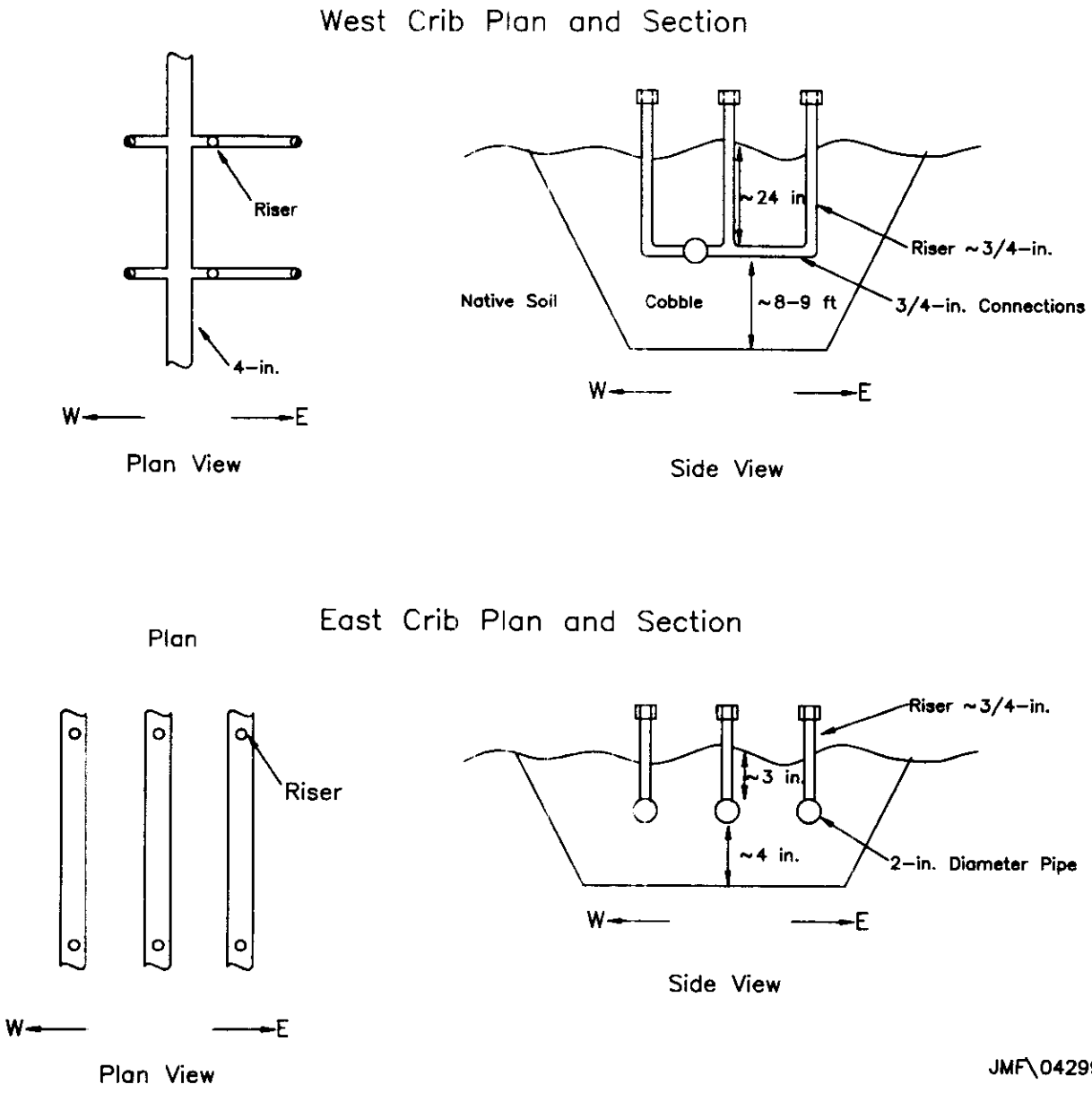
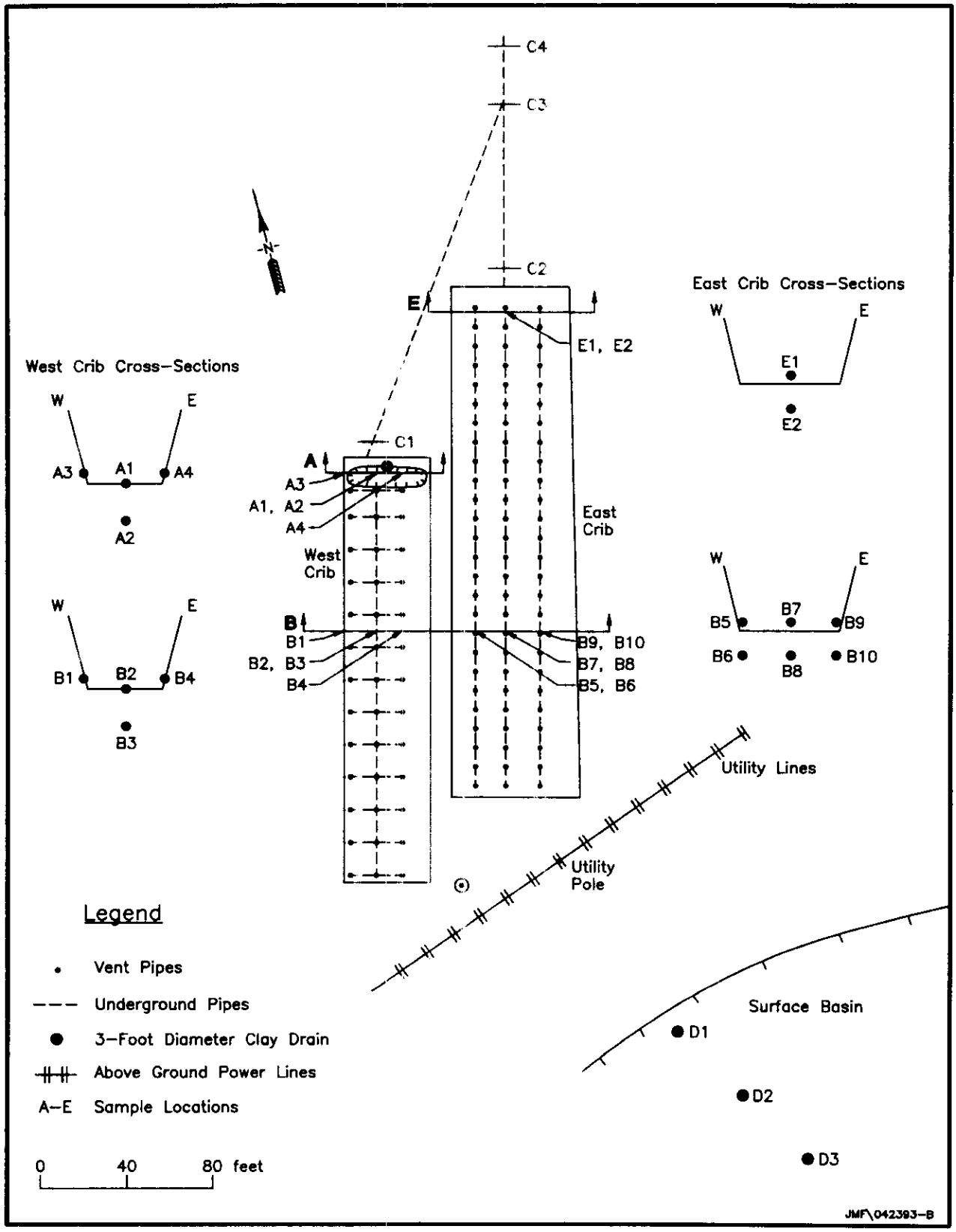


Figure 6. Soil Sampling Locations.



2.0 RISK ASSESSMENT

The purpose of this risk assessment is to provide a human health and ecological risk assessment for the White Bluffs Pickling Acid Cribs Site.

2.1 CONCEPTUAL MODEL OF HUMAN EXPOSURE

A conceptual model for human exposure used the *Hanford Site Baseline Risk Assessment Methodology* (HSBRAM) to identify potential human exposure pathways (DOE-RL 1993b). The conceptual model summarizes exposure paths that hazardous substances may take to reach potential receptors. The following are the key elements necessary for a complete exposure pathway:

1. A source and mechanism of contaminant release
2. Transport mechanisms and media
3. Exposure media
4. Exposure routes
5. Human receptors.

All elements must be present for an exposure pathway to be complete. At the pickling acid cribs, the contaminant source is soil. The release and transport mechanisms of the soil include wind erosion and direct human contact with the soil through intrusive activities. Release mechanisms can be divided into primary and secondary categories. A primary release is from a primary contaminant source, and a secondary release is from a secondary contaminant source. The most significant release source at the Hanford Site is infiltration of past discharges of process effluents into underlying soils (primary transport) followed by the release of contaminated surface soils through fugitive dust, volatile emissions, or through direct human contact with the soil (secondary release mechanism). For the pickling acid cribs, the transport media include soil and air.

Current institutional controls prevent intrusion into the site; however, at the present time this site is not in use. The Hanford Future Site Uses Working Group (HFSUWG) recommended the pickling acid cribs area be classified for unrestricted land use and listed three options for consideration: Native American uses; limited recreation, recreation-related commercial, and wildlife uses; and wildlife and recreation uses (Drummond et al. 1992). Because future land use is not yet defined, a conservative approach will be used for the human health evaluation.

The risk evaluation for the pickling acid cribs is conducted assuming a conservative residential land use scenario for which the oral, inhalation, and external exposure pathways are evaluated. The residential exposure parameters include intake rate, exposure frequency and duration, body weight, and averaging time. The exposure assessment methodology is presented in Section 2.2 and Appendices A and C of the HSBRAM (DOE-RL 1993b).

The maximum concentration of a COPC detected in a specific medium is used as the exposure point concentration. The maximum concentration is used rather than calculating a 95% upper

confidence limit of the mean (UCL) because of the limited number of samples that are available for the Pickling Acid Crib.

2.2 IDENTIFICATION OF COPC IN PICKLING ACID CRIBS

The identification of COPCs is conducted according to recommendations provided in the HSBRAM (DOE-RL 1993b), and the *Risk Assessment Guidance for Superfund* (EPA 1989).

Data obtained from the *White Bluffs Pickling Acid Cribs Expedited Response Action Proposal* (DOE-RL 1993c) and from the data validation report for the Pickling Acid Crib ERA (WHC 1993a) are used to identify COPCs. Identification of COPCs is a two-step process: first, data are assessed for useability; second, a useable data screening is performed as recommended in HSBRAM (DOE-RL 1993b)

2.2.1 Data Usability

In the data usability assessment, the minimum and maximum concentrations of each contaminant are identified from the data validation report (WHC 1993a). A qualifier for the maximum value is assigned, if appropriate. The inorganic analytes are compared to equipment blank concentrations and are considered a positive sample if they exceed five times the maximum amount detected in any blank (EPA 1989). The positive samples are carried through the risk assessment screening. Data usability is evaluated in Tables A-4 through A-7 in Appendix A.

2.2.2 Screening of Usable Data

In screening of usable data, the maximum concentration of the nonradioactive analytes are compared to Hanford Site background concentration obtained from the log normal distribution and the 95% upper tolerance limit (UTL) based on 95% coverage (DOE-RL 1993a). If the nonradioactive analyte concentration is less then the Hanford Site background concentration, it is eliminated from further evaluation in the risk assessment.

Radionuclide sample concentrations are eliminated if the sample concentration is within the range of the environmental monitoring sample background concentrations (WHC 1993b; PNL 1987; and PNL 1992). The background concentrations are based on distant offsite sampling points that include Yakima, Sunnyside, McNary Dam, and Connell. These preliminary background samples are a regional data set and are considered conservative. The background concentrations are used because Hanford Site background concentrations are not yet available. Because there has been no documented release of radionuclides at the pickling acid cribs, and gamma spectrum analysis did not detect any radionuclides above background, a Radionuclide risk assessment is not required.

The remaining analytes are carried through risk-based screening (DOE-RL 1993b). The objective of the risk-based screening is to use target risk and toxicity information to evaluate which constituents are most likely to contribute significantly to risk. The risk-based concentrations used for screening the COPCs are based on target criteria of an incremental cancer risk (ICR) of 1E-07 for carcinogenic effects and a hazard quotient (HQ) of 0.1 for noncarcinogens effects. ICR can

be expressed as a carcinogenic potency factor or "unit cancer risk" which is defined as the excess risk caused by a continuous lifetime exposure to one unit of carcinogen concentration. HQ is the ratio of a single substance exposure level over a specified time period (e.g., subchronic) to a reference dose for that substance derived from a similar exposure period. The exposure parameters for the residential scenario are used for the risk-based screening. The risk-based concentrations noted in Tables A-4 through A-7 in Appendix A represent the most restrictive soil concentration and exposure pathway.

The analytes that exceed the risk-based concentration are retained for human health evaluation. All analytes that exceed Hanford Site background concentrations, even if less then the risk-based screen concentration, are retained for ecological risk evaluation. Both are indicated in Tables A-4 through A-7 in Appendix A.

2.3 HUMAN HEALTH RISK ANALYSIS

The human health evaluation quantifies exposure by first estimating intake using the parameters and assumptions for the residential scenario. The intake is then converted into a cancer risk value or a noncancer risk value based on the toxicity of the contaminants of potential concern. For cancer effects, toxicity is evaluated using slope factors from the Integrated Risk Information System (IRIS) and the Health Effects Assessment Summary Tables (HEAST). For systemic (noncancer) effects, toxicity is evaluated using a reference dose obtained from IRIS. The COPCs are considered a human health risk if the calculated risk value exceeds an ICR of 1E-06 for carcinogenic contaminants, and an HQ of 1.0 for noncarcinogenic contaminants.

Soil samples taken from the pickling acid cribs site were converted to fugitive dust concentrations to calculate risk for the inhalation pathway. Intakes for the inhalation of fugitive dust were calculated using the respirable particulate factor (PEF) of 2.0+07 m^3/kg. This value is based on the National Primary Ambient Air Quality Standard for particulate matter of 50 ug/m^3 and the assumption that 100% of the particulate is retained in human lungs and absorbed.

2.4 ECOLOGICAL RISK ANALYSIS

2.4.1 Ecological Receptors

Consistent with 100-Area Qualitative Risk Assessments, the Great Basin pocket mouse was chosen as the potential receptor to measure ecological risk. While no evidence of any animal was seen on the cribs due to the exposed cobble surface, rodents are active adjacent to the cribs and in the surface basin area.

2.4.2 Ecological Physical Setting

Once disturbed, terrestrial habitats on most of the Hanford Site will become dominated by cheatgrass along with tumbleweed and tumblemustard if enough soil exists. If insufficient soil remains in place for cheatgrass, the land tends to either support tumbleweed or be void of vegetation. This void vegetation pattern exists at the pickling acid cribs because of the cobble surface. A significant amount of the disturbed surface has lost the natural cover of sandy soils and is bare cobble. The rest is dominated by cheatgrass, with tumbleweed and tumblemustard also present. The species and condition of vegetation appeared normal for a disturbed site with sandy soils. During a survey on October 27, 1993, the sandy soils around the cribs showed small rodent (probably Great Basin pocket mouse) tracks and diggings. Some badger digging was also present near the crib sites. However, no evidence of animal activity was seen on the cobble of the cribs themselves. Deer and a loggerhead shrike were seen within 100 m of the site. The area identified as the surface basin was vegetated almost entirely with cheatgrass and tumbleweed, indicating past disturbance. It had limited signs of small mammal activity; common animals, such as the pocket mouse, are probably resident.

2.5 CONTAMINANTS OF CONCERN

At the 100-IU-5 Operable Unit, one metal (zinc) is retained for further ecological consideration based on comparisons with background. Zinc is reported above Hanford Site background in the underground pipes (Table A-7). Zinc concentrations range from 35.0 to 1070 ppm. The average range of zinc concentrations in soil is 10 to 300 ppm (Friberg et al. 1979). Zinc is relatively nontoxic, and zinc deficiencies in diets appear to be more significant than excessive zinc (Friberg et al. 1979). However, Friberg et al. (1979) reported that additions of approximately 1,000 ppm zinc in the diets of weanling pigs for more than 1 month depressed the rate of growth and food intake.

The Pickling Acid Cribs Expedited Response Action Proposal (DOE-RL 1993c) provides a discussion of the source of the highest values of zinc as the galvanized pipe leading into the surface basin. This pipe was scraped while excavating, and samples were taken directly beside the pipe. In addition, zinc is not listed as a contaminant disposed of at the site.

2.6 BASELINE RISK ASSESSMENTS

2.6.1 Human Health Risk Results

All COPC (except zinc) have been eliminated based on comparison to background concentrations. The maximum zinc concentration detected at the site was 554 mg/kg, which is well below the most restricted zinc soil concentration (2,400 mg/kg) in the human health risk-based screening. Zinc is eliminated when compared to this risk-based concentration. Therefore, based on the human health risk assessment, there are no contaminants of concern for human health risk associated with the pickling acid crib.

2.6.2 Ecological Risk Results

The highest zinc sample concentrations were taken directly beside the underground pipes. The pipes were scraped during excavation and are probably the source of the zinc. Zinc is not considered a contaminant of concern for ecological risk because the zinc is localized, is not listed as a contaminant disposed of at the site, and is considered to be relatively nontoxic at the maximum detected concentration.

2.6.3 Uncertainty in the Risk Assessment Process

The risks presented in this risk assessment are conditional estimates given multiple assumptions about exposures, toxicity, and other variables. The uncertainty in the risk characterization focuses on specific uncertainties related to the waste site such as data evaluation and sampling quantity, and to the risk assessment process (e.g., toxicity information and exposure assumptions).

2.7 HUMAN HEALTH AND ECOLOGICAL ANALYSIS OF SURFACE BASIN

The identification of COPCs in the surface basin is provided for information purposes only, as this area is not included in the 100-IU-5 Operable Unit. Chromium VI, nickel and zinc are retained for human health and ecological risk evaluation (Appendix A, Tables A-6 and A-8).

2.7.1 Surface Basin Human Health COPCs

Chromium was detected in the surface basin at a maximum concentration of 43.1 mg/kg which represents a 1E-05 risk for the residential scenario inhalation pathway (Appendix A, Table A-9). All chromium is assumed to be chromium VI, which is the most toxic form, and provides the most conservative risk analysis. The concentrations used for determining the risk for this site were based on total chromium analyses. It is likely that a portion of the chromium that is quantified is chromium III, which is a less toxic form.

2.7.2 Surface Basin Ecological COPCs

Total chromium is reported in a range of 10.2 to 43.1 ppm in three samples, with reported background of 27.9 ppm (DOE/RL 1993a). Thus, the 15.2 ppm difference between the reported background and highest chromium value in the surface basin (43.1 ppm) does not appear to be significant.

Zinc is reported above background in the surface basin (values of 50.5, 68.7, and 554.0 ppm, Appendix A, Tables A-2 and A-6). The maximum is less than half the level reported by Friberg et al. (1979) to have noticeable effects on weanling pigs (reduced growth rates).

Zinc is not a contaminant known to have been disposed at the site, nor does it appear to be of ecological significance.

Nickel is also reported above Hanford Site background concentrations and is also retained for further analysis (Appendix A, Table A-6). Results for nickel ranged from 9.2 to 27.8 ppm. The reported background in DOE/RL 1993a is 25.3 ppm; background for the pickling acid crib (3 samples) was 8.7 to 9.9 ppm. Two 100-Area background soil samples from the biota sampling project reported nickel concentrations of 6.5 and 9.7 ppm (Landeen et al. 1993). Nickel is an essential element for some animal species and concentrations in farm soil range from 3 to 1,000 ppm depending on the mineral content of the top soil (Friberg et al. 1979). These values indicate that the result of 27.8 ppm, while 2.5 ppm above the reported Hanford Site background concentrations (DOE-RL 1993a) is within the normal range for nickel in the soil.

3.0 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Section 7.5 of the Action Plan in the *Hanford Federal Facility Agreement and Consent Order* (Ecology et al. 1989) contains the basic description of applicable or relevant and appropriate requirements (ARAR). In addition to certain other nonpromulgated criteria, the ARARs include cleanup standards, standards of control, and other substantive environmental protection requirements and criteria for hazardous substances as specified under federal or state laws and regulations.

Based on the human health and ecological risk assessments, the White Bluffs Pickling Acid Cribs now do not pose an unacceptable risk to human health or the environment. In the absence of unacceptable human health or environmental risks, no cleanup actions at the White Bluffs Pickling Acid Crib are necessary. There are no cleanup activities needed at the White Bluffs Pickling Acid Crib. Therefore, there are no ARARs that apply to the White Bluffs Pickling Acid Crib site.

4.0 SUMMARY

The chemical concentrations detected at the White Bluffs Pickling Acid Cribs Site indicated that the cribs pose no threat to human health or the environment. This was verified by the risk assessment (Appendix A, Table A-10). In the human health risk assessment screening process, all contaminants of potential concern concentrations (except zinc) are less than background and were eliminated on that basis. Zinc was eliminated based on human health and ecological risk assessments.

Based on these results, there is no need to develop or screen remediation alternatives. There is only one alternative: no action. Thus, there is no need to include sections in this RI/FS for developing, screening, or detailed analysis of alternatives as suggested in the typical FS format (EPA 1988). No action to remove contamination is required for the completion of the White Bluffs Pickling Acid Cribs ERA.

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APPENDIX A

TABLES

This appendix contains all the tables referred to in the White Bluffs Pickling Acid Cribs Feasibility Study Report. The tables include summarized results from the White Bluffs Pickling Acid Crib Expedited Response Action (ERA) Proposal, and the human health and ecological risk assessments.

Tables A-2 and A-3 present the condensed results of soil sampling analysis. The two tables have been separated into anions and metals, which were the primary contaminants of concern during the characterization activities. Both sets of data have been condensed to include only metals and anions, which would be indicators of acid etch solution disposal. A complete set of all sample analysis results is provided in the ERA proposal. The definition of qualifiers is presented below.

U Indicates the compound or analyte was analyzed for and not detected. The value reported is the sample quantitation limit corrected for sample dilution and moisture content by the laboratory.

UJ Indicates the compound or analyte was analyzed for and not detected. Because of quality control (QC) deficiencies identified during data validation, the value reported may not accurately reflect the sample quantitation limit.

J Indicates the compound or analyte was analyzed for and detected. The associated value is estimated, but the data are usable for decision-making processes.

R Indicates the compound or analyte was analyzed for and because of an identified QC deficiency the data are not usable.

JN Indicates presumptive evidence of a compound at an estimated value.

VJN Indicates the compound or analyte was originally identified from presumptive evidence. Because of QC deficiencies identified during data validation, the value reported may not accurately reflect the sample quantitation limit

Table A-1. Soil Sampling Locations and Analyses.

Sample site	Sample identifier (HEIS #)	Location of sample	Analyses
A1	B07PY8	10 ft below surface, taken within 1 foot of interface between soil and crib bottom.	FS
A2	B07PZ1	14 ft below surface, directly beneath A1	FS
A3	B07PY9	9 ft below surface	SS
A4	B07PZ3	8 ft below surface	SS
B1	B07PZ5	6-7 ft below surface	SS
B2	B07PZ6	11-12 ft below surface	FS
B3	B07PZ7	15-16 ft below surface	FS
B4	B07P78	6-7 ft below surface	SS
B5	B07PZ9	5-6 ft below surface	SS
B6	B07Q00	10-11 ft below surface	SS
B7	B07Q01	5-6 ft below surface	FS
B8	B07Q03	10-11 ft below surface	FS
B9	B07Q04	5-6 ft below surface	SS
B10	B07Q05	10-11 ft below surface	SS
C1	B07Q06	3-4 ft below surface	SS
C2	B07Q09	4-5 ft below surface	SS
C3	B07Q07	3-4 ft below surface	SS
C4	B07Q08	3-4 ft below surface	SS
D1	B07Q10	6-12 in. below surface	SS
D2	B07Q11	6-12 inches below surface	SS
D3	B07Q12	6-12 inches below surface	FS
E1	B07PZ2	7 ft below surface	FS
E2	B07PZ4	12 ft below surface	FS
NA	B07Q02	Duplicate of sample B07Q01	FS
NA	B07Q13	Split of sample B07Q12	FS
NA	B07Q14, B07Q15, B07Q16	Background samples, taken in undisturbed soil west of the cribs (6-12 inches below surface)	SS
NA	**B07PZ0**	Equipment Blank	SS

FS = Indicates sample was analyzed for the full suite of analyses, which includes TAL Metals, 6010 FOR ZR, Anions (EPA 300.0), Nitrate/nitrite (EPA 353.2), Ammonia, pH, Calcium Carbonate (Hardness, EPA 130.2), Semi-VOA (CLP), VOA (CLP), Gamma Spec, TPH (Diesel Range), TPH (Heavier than Diesel Range)

SS = The short list samples were analyzed for expected contaminants. These are all categories in the FS list that have been underlined.

NA = Not applicable; sample site not numbered.

Table A-2. Metals (Reported in mg/kg). (2 sheets)

Sample	Al	Cr	Cu	Fe	Pb	Mg	Mn	Ni	Zn	Zr
B07PY8	5360	9.1	23.5	14600	3.9	3310	138 J	6.2 B	71.8	17.1 U
B07PY9	5650	9.4	16.7 U	14200	3.4	3610	142 J	8.3	63.7	17.5 U
B07PZ1	5700	11.2	20.7	13500	4.1	4080	175 J	9.5	50.7	18.0
B07PZ3	5020	8.0	13.6 U	15300	3.1	3460	149 J	7.1 B	60.5	18.3 U
Section A Avg.	5433	9.4	18.6	14400	3.6	3615	151	7.8	61.7	17.7
B07PZ2	5010	9.3	17.3 U	12700	3.1	3720	156 J	8.8	30.3	17.4 U
B07PZ4	5550	10.0	17.6 U	13200	4.0	4350	213 J	10.3	31.3	18.6 U
Section E Avg.	5280	9.7	17.5	12950	3.6	4035	185	9.6	30.8	18.0
B07PZ5	6810	14.0	17.6 U	15900	4.2	5130	226 J	14.3	43.0	18.2 U
B07PZ6	4310	7.7	15.2 U	12900	3.5	2960	144 J	7.9 B	30.5	17.9 U
B07PZ7	4630	8.7	13.7 U	12300	2.6	3570	177 J	8.0 B	28.8	18.1 U
B07PZ8	4640	9.1	11.0 U	11600	2.5	3520	149 J	8.7	28.0	17.3
B07PZ9	7000	13.6	16.9 U	15600	6.5	6500	265 J	13.3	40.9	18.6 U
B07Q00	4140	7.5	13.7 U	14900	2.5	3420	183 J	8.8	30.6	17.4 U
B07Q01	5800	10.2	14.6 U	15000	3.3	4620	190 J	10.8	35.6	17.5 U
B07Q03	4320	9.3	11.8 U	12600	2.9	3560	178 J	8.8	28.0	16.9 U
B07Q04	5930	11.0	10.5	16000	3.4	4920	212	10.7	38.2	18.7 U
B07Q05	4170	7.2	13.2	15900	2.5	3470	218	9.6	33.6	20.8 U
Section B Avg.	5175	9.8	13.8	14270	3.4	4167	194	10.1	33.7	18.1
B07Q06	5730	10.0	9.7	17600	2.9	4390	240	9.8	35.0	17.3 U
B07Q09	5720	7.9	10.7	20800	3.4	4320	376	11.3	46.6	17.7 U
B07Q07	6010	9.9	10.4	19100	3.6	4410	257	10.6	1020.0	25.9
B07Q08	4070	6.5	6.6 U	12900	4.3	3220	196	7.4 B	1070.0	17.9 U
Section C Avg.	5383	8.6	9.4	17600	3.6	4085	267	9.8	542.9	19.7

Table A-2. Metals (Reported in mg/kg). (2 sheets)

Sample	Al	Cr	Cu	Fe	Pb	Mg	Mn	Ni	Zn	Zr
B07Q10	5730	10.2	18.7	16300	6.7	3740	190	9.2	68.7	19.2 U
B07Q11	8060	13.3	14.2	23400	5.1	5210	263	12.5	554.0	19.4 U
B07Q12	7370	43.1	11.4	19200	3.9	4040	177	27.8	50.5	17.2 U
Section D Avg.	7053	22.2	14.8	19633	5.2	4330	210	16.5	224.4	18.6
Background										
B07Q14	6090	8.5	9.3 U	20500	3.5	3850	347	8.7	46.6	20.9
B07Q15	6090	8.8	9.1 U	17900	3.1	3680	317	8.9	43.3	20.4 U
307Q16	7220	9.8	10.1	23300	3.5	4180	372	9.9	49.4	30.7

Table A-3. Anions (Reported in mg/kg). (2 sheets)

Sample	NO_3/NO_2 (AS N)	Chloride	Fluoride	Phosphate	Sulfate	pH
B07PY8 A1	7.41	1.80 J	0.30 J	0.80 UJ	25.00 J	5.50
B07PY9 A3	3.83	2.30 J	0.40 J	0.80 UJ	15.00 J	6.70
B07PZ1 A2	3.89	1.40 J	0.60 J	1.00 J	13.00 J	7.90
B07PZ3 A4	2.52	1.80 J	1.40 J	1.00 J	10.00	7.20
A Average	4.41	1.83	0.43	0.90	15.75	6.83
B07PZ2 E1	2.42 U	2.10 J	1.10 J	1.00 J	11.00 J	8.30
B07PZ4 E2	2.42 U	2.10 J	0.80 J	1.00 J	11.00 J	8.90
E Average	2.42	2.10	0.95	1.00	11.00	8.60
B07PZ5 B1	2.43 U	2.20 J	0.50 J	2.00 J	6.00 J	9.00
B07PZ6 B2	2.53 U	2.00 J	0.40 J	0.80 UJ	8.00 J	7.80
B07PZ7 B3	2.48 U	1.80 J	0.30 J	1.00 J	6.00 J	8.60
B07PZ8 B4	2.59 U	2.20 J	0.30 J	1.00 J	5.00 J	8.30
B07PZ9 B5	2.46 U	2.20 J	0.70 J	0.80 UJ	10.00 J	8.70
B07Q00 B6	2.46 U	1.80 J	0.30 J	1.00 J	6.00 J	9.10
B07Q01 B7	2.54 U	2.00 J	1.00 J	1.00 J	10.00 J	9.20
B07Q03 B8	2.57 U	2.10 J	0.30 J	1.00 J	6.00 J	9.60
B07Q04 B9	2.55 UJ	2.30 J	1.00 J	1.00 J	6.00 J	9.10
B07Q05 B10	2.52 UJ	2.10 J	0.50 J	0.80 UJ	5.00 J	8.50
B Average	2.51	2.07	0.53	1.04	6.80	8.79
B07Q06 C1	2.47 UJ	B07Q06 C1	1.50 J	0.80 UJ	292.00 J	9.00
B07Q09 C2	2.51 UJ	181.00 J	2.50	0.80 J	329.00 J	8.50
B07Q07 C3	2.42 UJ	7.80 J	1.90 J	2.00 UJ	44.00 J	10.40
B07Q08 C4	2.50 UJ	2.30 J	1.40 J	1.00 J	4.00 J	8.50
C Average	2.48	50.78	1.83	1.15	167.25	9.10
B07Q10 D1	16.30 J	5.10 J	0.70 J	2.00 J	95.00 J	6.80
B07Q11 D2	3.70 J	3.40 J	1.00 J	2.00 J	42.00 J	6.40
B07Q12 D3	3.52 J	11.50 J	1.40 J	1.00 J	23.00 J	7.10
D Average	7.8	6.7	1.0	1.7	53.3	6.8

Table A-3. Anions (Reported in mg/kg). (2 sheets)

Sample	NO_3/NO_2 (AS N)	Chloride	Fluoride	Phosphate	Sulfate	pH
Background Readings at the Site						
B0Q14	3.24 J	2.3 J	0.6 J	2 J	4 J	
B0Q15	5.81 J	3 J	0.3 J	2 J	54 J	
B0Q16	2.51 UJ	3 J	0.7 J	2 J	4 J	

Table A-4. Potential Contaminants of Concern: West Crib. (3 sheets)

Data Usability					Screening Criteria Based on HSBRAM			Analyte Status
Analyte	Range	Qualifier for Max value	Blank Adjustment		Frequency of Detection	Background(a)	Risk-based screen(b)	
			Max Blank	Analyte Exceeds 5X Rule				
Radionuclides (all concentrations in pCi/g)								
Radium 226	0.42±0.087 / 0.48±0.086				4/4	0.506/0.844(c) 0.6950±0.114(d)	0.63	Eliminated: Less than background
Thorium 228	0.63±0.055 0.83±0.061				4/4	0.461/1.35(e) 0.729±0.289(f)	0.12	Eliminated: Less than background
Inorganics (all concentrations in mg/kg)								
Aluminum	4310/ 6810		33.9	yes	8/8	15600		Eliminated: Less than background
Chromium VI (g)	7.7/14.0				8/8	27.9		Eliminated: Less than background
Copper	20.7/23.5				2/8	28.2		Eliminated: Less than background
Iron	11600/ 15900		451	yes	8/8	39160		Eliminated: Less than background
Lead	2.5/4.2		0.77	yes	8/8	14.75		Eliminated: Less than background

Table A-4. Potential Contaminants of Concern: West Crib. (3 sheets)

Data Usability					Screening Criteria Based on HSBRAM			Analyte Status
Analyte	Range	Qualifier for Max value	Blank Adjustment		Frequency of Detection	Background(a)	Risk-based screen(b)	
Magnesium	2960/ 5130		7.3B	yes	8/8	8760		Eliminated: Less than background
Manganese	138/226	J	0.23J	yes	8/8	612		Eliminated: Less than background
Nickel	6.2/14.3				8/8	25.3		Eliminated: Less than background
Zinc	28.0/71.8				8/8	79		Eliminated: Less than background

Table A-4. Potential Contaminants of Concern: West Crib. (3 sheets)

Data Usability					Screening Criteria Based on HSBRAM			Analyte Status
Analyte	Range	Qualifier for Max value	Blank Adjustment 5X Rule		Frequency of Detection	Back-ground(a)	Risk-based screen(b)	
			Max Blank	Analyte Exceeds 5X Rule				
Anions (All concentrations in mg/kg)								
Nitrate/ Nitrite	2.52/7.41				4/8	199		Eliminated: Less than background
Chloride	1.4/2.3	J	3.0 J	No	8/8	763		Eliminated based on 5 X Rule and less than background
Fluoride	0.3/1.4	J	0.2 J	Yes	8/8	12		Eliminated: Less than background
Phosphate	1.0/2.0	J			5/8	16		Eliminated: Less than background
Sulfate	5.0/25.0	J	3.0 J	Yes	8/8	1320		Eliminated: Less than background
pH	5.5/9.0				8/8	(h)		

J Qualifier indicates the associated numerical value is an estimated quantity. RAGS, 1989

5 X Rule: The sample results are positive if the site sample exceeds five times the maximum amount detected in any blank (RAGS 1989).

(a) *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes*, 95% UTL (DOE 1993).

(b) Indicates the most restrictive risk-based soil concentration and exposure pathway.

(c) Minimum and maximum values for Hanford Site background concentrations of radium-226 (PNL 1987-1992).

(d) The mean for Hanford Site background concentrations of radium-226 (PNL 1987-1992).

(e) Minimum and maximum values for Hanford Site background concentrations of thorium-228 (WHC 1993a).

(f) The mean for Hanford Site background concentrations of thorium-228 (WHC 1993a).

(g) All chromium is assumed to be chromium VI, which is the most toxic form of chromium and provides the most conservative approach to the risk analysis.

(h) No Hanford Site background pH values are available.

Table A-5. Potential Contaminants of Concern Screen: East Crib. (2 sheets)

Data Usability					Screening Criteria Based on HSBRAM			
Analyte	Range	Qualifier for Max value	Blank Adjustment 5X Rule		Frequency of Detection	Background(a)	Risk-based screen(b)	Analyte Status
			Max Blank	Analyte Exceeds 5X Rule				
Radionuclides (All concentrations in pCi/g)								
Radium 226	0.49±0.068/ 0.57±0.083				5/5	O.506/0.844(c) 0.729±0.114(d)		Eliminated: Less than background
Thorium 228	0.70±0.056/ 0.99±0.072				5/5	0.461/1.35(e) 0.729±0.289(f)		Eliminated: Less than background
Inorganics (All concentrations in mg/kg)								
Aluminum	4140/7000		33.9	Yes	8/8	15600		Eliminated: Less than background
Chromium VI (g)	7.2/13.6				8/8	27.9		Eliminated: Less than background
Copper	10.5/13.2				2/8	28.2		Eliminated: Less than background
Iron	12600/16000		451	Yes	8/8	39160		Eliminated: Less than background
Lead	2.5/6.5		0.77	Yes	8/8	14.75		Eliminated: Less than background
Magnesium	3420/6500		7.3 B	Yes	8/8	8760		Eliminated: Less than background

Table A-5. Potential Contaminants of Concern Screen: East Crib. (2 sheets)

Data Usability					Screening Criteria Based on HSBRAM			
Analyte	Range	Qualifier for Max value	Blank Adjustment 5X Rule		Frequency of Detection	Background(a)	Risk-based screen(b)	Analyte Status
			Max Blank	Analyte Exceeds 5X Rule				
Anions (All concentrations in mg/kg)								
Chloride	1.80/2.30	J	3.0 J	No	8/8	763		Eliminated based on 5 X Rule and less than background
Fluoride	0.30/1.10	J	0.2 J	Yes	8/8	12		Eliminated: Less than background
Phosphate	1.00/1.00	J			6/8	16		Eliminated: Less than background
Sulfate	5.00/11.00	J	3.0 J	No	8/8	1320		Eliminated based on 5 X Rule and less than background
pH	8.30/9.60				8/8	(h)		

J Qualifier indicates the associated numerical value is an estimated quantity. RAGS, 1989

5 X Rule: The sample results are positive if the site sample exceeds five times the maximum amount detected in any blank. RAGS, 1989

(a) Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes, 95% UTL (DOE, April 1993)

(b) Indicates the most restrictive risk-based soil concentration and exposure pathway

(c) Minimum and maximum range for Hanford site background concentrations of radium-226 (PNL 7346, Hanford Site Environmental Report (1987-1992)).

(d) The mean and standard deviation for Hanford site background concentrations of radium-226 (PNL 7346, Hanford Site Environmental Report (1987-1992)).

(e) Minimum and maximum range for Hanford site background concentrations of thorium-228 (RCRA closure project, WHC-SD-DD-TI-075, Rev 0).

(f) The mean and standard deviation for Hanford site background concentrations of thorium-228 (RCRA closure project, WHC-SD-DD-TI-075, Rev 0).

(g) All Chromium is assumed to be Chromium VI which is the most toxic form and provides the most conservative risk analysis.

(h) No Hanford site background pH values are available

Table A-6. Potential Contaminants of Concern Screen: Surface Basin. (3 sheets)

Data Usability					Screening Criteria Based on HSBRAM			
Analyte	Range	Qualifier for Max value	Blank Adjustment 5X Rule		Frequency of Detection	Background(a)	Risk-based screen(b)	Analyte Status
			Max Blank	Analyte Exceeds 5X Rule				
Radionuclides (All concentrations in pCi/g)								
Radium 226	0.56±0.096				1/1	O.506/0.844(c) 0.695±0.114(d)		Eliminated: Less than background
Thorium 228	1.00±0.084				1/1	0.461/1.35(e) 0.729±0.289(f)		Eliminated. Less than background
Inorganics (All concentrations in mg/kg)								
Aluminum	5730/8060		33.9	Yes	3/3	15600		Eliminated: Less than background
Chromium VI (g)	**10.2/43.1**				**3/3**	**27.9**	**0.39**	**Retained for Ecological and Human Health analysis**
Copper	11.4/18.7				3/3	28.2		Eliminated: Less than background
Iron	16300/23400		451	Yes	3/3	39160		Eliminated: Less than background
Lead	3.9/6.7		0.77	Yes	3/3	14.75		Eliminated: Less than background
Magnesium	3740/5210		7.3 B	Yes	3/3	8760		Eliminated: Less than background

Table A-6. Potential Contaminants of Concern Screen: Surface Basin. (3 sheets)

Data Usability					Screening Criteria Based on HSBRAM			
Analyte	Range	Qualifier for Max value	Blank Adjustment 5X Rule		Frequency of Detection	Background(a)	Risk-based screen(b)	Analyte Status
			Max Blank	Analyte Exceeds 5X Rule				
Anions (All concentrations in mg/kg)								
Nitrate/Nitrite	3.52/16.30	J			3/3	199		Eliminated: Less than background
Chloride	3.40/11.50	J	3.0 J	No	3/3	763		Eliminated based on 5 X Rule and less than background
Fluoride	0.70/1.40	J	0.2 J	Yes	3/3	12		Eliminated: Less than background
Phosphate	1.00/2.00	J			3/3	16		Eliminated. Less than background
Sulfate	23.00/95.00	J	3.0 J	Yes	3/3	1320		Eliminated: Less than background
pH	6.40/7.10				3/3	(h)		

J Qualifier indicates the associated numerical value is an estimated quantity. RAGS, 1989
5 X Rule. The sample results are positive if the site sample exceeds five times the maximum amount detected in any blank. RAGS, 1989
(a) Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes 95% UTL (DOE, April 1993)
(b) Indicates the most restrictive risk-based soil concentration and exposure pathway
(c) Minimum and maximum, and the mean values for Hanford site background concentrations of radium-226 (PNL 7346, Hanford Site Environmental Report, 1987-1992)
(d) The mean and standard deviation values for Hanford site background concentrations of radium-226 (PNL 7346, Hanford Site Environmental Report, 1987-1992)
(e) Minimum and maximum values for Hanford site background concentrations of thorium-228 (RCRA Closure Project, WHC-SD-DD-TI-075, Rev 0)
(f) The mean and standard deviation values for Hanford site background concentrations of thorium-228 (RCRA Closure Project, WHC-SD-DD-TI-075, Rev 0)
(g) All Chromium is assumed to be Chromium VI which is the most toxic form and provides the most conservative risk-based analysis
(h) No Hanford site background pH values are available

Table A-7. Potential Contaminants of Concern Screen: Underground Pipes. (2 sheets)

Data Usability					Screening Criteria Based on HSBRAM			
Analyte	Range	Qualifier for Max value	Blank Adjustment 5X Rule		Frequency of Detection	Back-ground(a)	Risk-based screen(b)	Analyte Status
			Max Blank	Analyte Exceeds 5X Rule				
Inorganics (All concentrations in mg/kg)								
Aluminum	4070/6010		33.9	Yes	4/4	15600		Eliminated: Less than background
Chromium VI (d)	6.5/10.0				4/4	27.9		Eliminated: Less than background
Copper	9.7/10.7				3/4	28.2		Eliminated: Less than background
Iron	12900/20800		451	Yes	4/4	39160		Eliminated: Less than background
Lead	2.9/4.3		0.77	Yes	4/4	14.75		Eliminated: Less than background
Magnesium	3220/4410		7.3 B	Yes	4/4	8760		Eliminated: Less than background
Manganese	196/376		0.23 J	Yes	4/4	612		Eliminated: Less than background
Nickel	9.8/11.3		7.4 J	No	4/4	25.3		Eliminated based on 5 X Rule and less than background
Zinc	35.0/1070				4/4	79	2400	Retained for Ecological analysis
Zirconium	25.9				1/4	57.3		Eliminated: Less than background

Table A-7. Potential Contaminants of Concern Screen: Underground Pipes. (2 sheets)

Data Usability					Screening Criteria Based on HSBRAM			
Analyte	Range	Qualifier for Max value	Blank Adjustment 5X Rule		Frequency of Detection	Background(a)	Risk-based screen(b)	Analyte Status
			Max Blank	Analyte Exceeds 5X Rule				
Anions (All concentrations in mg/kg)								
Chloride	2.30/181.00	J	3.0 J	Yes	4/4	763		Eliminated: Less than background
Fluoride	1.40/2.50		0.2 J	Yes	4/4	12		Eliminated: Less than background
Phosphate	0.80/1.00	J			2/4	16		Eliminated: Less than background
Sulfate	4.00/329.00	J	3.0 J	Yes	4/4	1320		Eliminated: Less than background
pH	8.50/10.40				4/4	(c)		

B Reported value is less than the contract-required detection limit and greater than the
J Qualifier indicates the associated numerical value is an estimated quantity. RAGS, 1989
instrument detection limit. RAGS, 1989
5 X Rule: The sample results are positive if the site sample exceeds five times the maximum amount detected in any blank. RAGS, 1989
(a) Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes (DOE, April 1993)
(b) Indicates the most restrictive risk-based soil concentration
(c) No Hanford site background pH values are available
(d) All Chromium is assumed to be Chromium VI which is the most toxic form and provides the most conservative risk analysis.

Table A-8. Surface Basin Preliminary Risk-Based Screen for Non-Radioactive Contaminants.

Contaminant	Inhalation Pathway				Oral Pathway			
	Carcinogenic Effects		Non-carcinogenic Effects		Carcinogenic effects		Non-carcinogenic effects	
	Inhalation SF $(mg/kg\text{-}d)^{-1}$	Soil Concentration at Inhalation ICR = 1E-07 (mg/kg)	Inhalation RfD (mg/kg-d)	Soil Concentration at Inhalation HQ = 0.1 (mg/kg)	Oral SF $(mg/kg\text{-}d)^{-1}$	Soil concentration at Oral ICR = 1E-07 (mg/kg)	Oral RfD (mg/kg-d)	Soil Concentration at Oral HQ = 0.1 (mg/kg)
Chromium VI(c)	42.0[a]	0.39	(b)		(b)		0.005[a]	40.0

[a]Integrated Risk Information System (IRIS, EPA 1993)
(b) No RfD or SF available to evaluate this pathway
(c) All Chromium is assumed to be Chromium VI which is the most toxic form and provides the most conservative risk analysis.
Shading indicates maximum concentration of contaminant exceeds the risk-based concentration

Table A-9. Human Health Risk Analysis for Pickling Acid Cribs and Surface Basin Residential Scenario: Inhalation Exposure Pathway.

Waste Site	Contaminant	Maximum concentration	Intake	SF[a]	ICR[b]	RfD[c]	HQ[d]
West Crib	No COPCs identified						
East Crib	No COPCs identified						
Underground Pipes	No COPCs identified						
Surface Basin	Chromium VI[e]	43.1 mg/kg	2.6E-07 mg/kg-d	4.2E+01 (mg/kg-d)$^{-1}$	1E-05		
Total Risk					1E-05		

[a] SF - slope factor
[b] ICR - Lifetime incremental cancer risk
[c] There are no inhalation RfD (reference dose) values available to evaluate noncarcinogenic risk for this analyte
[d] Hazard Quotient
[e] All chromium is assumed to be chromium VI which is the most toxic form and provides the most conservative risk assessment analysis
Shading indicates that target human health risk of 1E-06 is exceeded

Table 10. Human Health Risk Analysis for Pickling Acid Crib Residential Scenario: Ingestion Exposure Pathway.

Waste Site	Contaminant(s)	Maximum Concentration	Intake (mg/kg-d)	RfD[a] (mg/kg-d)	HQ[b]	SF[c] (mg/kg-d)-1	ICRd
West Crib	None identified						
East Crib	None identified						
Surface Basin	Chromium VI[f]	43.1 mg/kg	5.6E-04	.005	1E-01	(e)	
Underground Pipes	None identified						
Total Risk					1E-01		

[a]Reference dose
[b]Hazard quotient
[c]Slope factor
[d]Lifetime incremental cancer risk
(e) No SF available to evaluate this pathway
[f] All chromium is assumed to be chromium VI which is the most toxic form and provides the most conservative risk analysis.

APPENDIX B

JOINT LETTER FROM REGULATORS

9201739

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
Mail Stop PV-11 • Olympia, Washington 98504-8711 • (206) 459-6000

March 4, 1992

Mr. Steven H. Wisness
Hanford Project Manager
U.S. Department of Energy
P.O. Box, 550 A5-19
Richland, WA 99352

Re: Expedited Responses Action Planning Proposals and Implementation

Dear Mr. Wisness:

On January 22, 1992, a meeting was held to discuss the selection of new Expedited Response Actions (ERA). The Washington State Department of Ecology (Ecology) and the U.S. Environmental Protection Agency (EPA) assumed the task of identifying candidate sites for planning proposal preparation, and identification of lead regulatory agency.

The primary reasons to perform ERAs are to minimize or eliminate the potential for release of hazardous substances and/or radionuclides in the environment and to initiate actions consistent with anticipated remedy selections. The final remedy selection would be made after completion of a Remedial Investigation/Feasibility Study (RI/FS) or a RCRA Facility Investigation/ Corrective Measures Study (RFI/CMS).

On December 12, 1991, a meeting was held to discuss selection of new ERAs. In this meeting, the U.S. Department of Energy (DOE) and Westinghouse Hanford Company (WHC) provided EPA and Ecology with a list of twenty-two (22) candidate sites. In addition, DOE and WHC were seeking approval to proceed with EE/CA preparation for the 300 Area Burial Grounds. Based on this meeting and a continuing dialogue between Ecology, EPA, DOE, and WHC, four (4) sites from the candidate list have been selected for planning proposal preparation. In addition, we request DOE submit planning proposals for two additional sites that were drafted previously for DOE, but as yet have not been submitted to Ecology and EPA.

Ecology and EPA prefer to delay initiation of an ERA on the 300 Area Burial Grounds. With the use of test pits in both the liquid disposal sites and the burial grounds, it appears the schedule for completion of RI/FS activities in 300-FF-1 may be accelerated. In addition, treatability tests planned for this year may identify appropriate means for remediating contaminated sediments from the liquid disposal sites as well as the burial grounds. Early completion of these investigations could result in a final Record of Decision for the 300-FF-1 Operable Unit earlier than projected. Ecology and EPA prefer

this course of action because it would potentially eliminate the need to handle waste from the burial grounds twice (once as part of the ERA and again as part of the final remedy).

Ecology and EPA have selected the following four sites for planning proposal preparations:

Sodium Dichromate Barrel Disposal Landfill in 100-IU-4 Operable Unit

The sodium dichromate barrel disposal site in the 100-IU-4 Operable Unit was selected in part due because this is the only facility located within the 100-IU-4 Operable Unit. Also, early remedial action at this operable unit may abate the potential of more extensive environmental degradation. Any ground water contamination from the sodium dichromate barrel site would be addressed as part of the 100-HR-3 Operable Unit. Removal of drums and contaminated sediments from this site may completely remediate the 100-IU-4 Operable Unit or may result in a no further action record of decision. This ERA would be designated as an Ecology lead site due to its location within the 100-HR-3 ground water operable unit for which Ecology is also the lead regulatory agency. An ERA at the sodium dichromate barrel disposal site should not require extensive planning or characterization prior to initiation and therefore field work should begin in fiscal year 1992.

U.S. Bureau of Reclamation 2,4-D Burial Site in 100-IU-3 Operable Unit

The U.S. Bureau of Reclamation 2,4-D burial site in the 100-IU-3 Operable Unit was also selected in part because it is the only documented hazardous waste disposal area located north of the Columbia River on the Hanford Site. In addition, this site is one of the few waste sites where DOE does not control access. Removal of drums and contaminated sediments from this site could eliminate the primary source of hazardous waste from this part of the Hanford Site and enhance public safety. The north slope area of the Hanford Site has been of particular interest to Ecology due to public access and the existing lease agreement between DOE and the Washington State Department of Fish and Wildlife. Ecology would be designated lead regulatory agency for both this ERA and the 100-IU-3 Operable Unit.

White Bluffs Pickling Acid Crib in 100-IU-5 Operable Unit

The White Bluffs pickling acid crib in the 100-IU-5 Operable Unit represents a significant source of acidic metal waste solution. This waste was generated from the final cleaning of reactor cooling pipes prior to installation in Hanford's eight single-pass reactors. These liquid disposal sites are located approximately one mile west of the 100-F Area near the old White Bluffs town site. Again, this site represents the primary source of contamination within the 100-IU-5 Operable Unit and a removal action at this facility will likely limit

Mr. Steve H. Wisness
March 4, 1992
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the need for and extensive investigation through an RI/FS. Since little is known about the extent of contamination associated with the White Bluffs pickling acid crib, some degree of characterization will likely be required as part of an ERA at this site. Due to its location upgradient of 100-F Area, EPA would be designated as lead regulatory agency for both this ERA and the 100-IU-5 Operable Unit.

<u>100-IU-1 River Rail Wash Pit and 600 Area Army Munitions Burial Site</u>

The 100-IU-1 operable unit contains two units. The riverland railroad car wash pit was decontaminated in 1963, and subsequently released from radiation zone status. Site records indicate that all items were removed from the munitions burial site in 1986. These sites are both located west of Highway 240 and lack the access controls present at nearly all other past practice sites at Hanford. EPA will be lead agency for this ERA and the 100-IU-1 Operable Unit. This presents the potential opportunity to reach a decision to take no further action at an operable unit after performing a confirmatory investigation. We expect that the entire investigation could be done as part of the ERA. If that is the case, the ERA would be followed by administrative steps to reach a final ROD.

Planning proposals for two additional sites are already drafted, but not released. These are for the 100 Area river outfall pipes and the 618-11 burial ground. These planning proposals should be transmitted to Ecology and EPA without delay. The regulatory lead agency will be identified for these proposals in the notice to proceed with EE/CA preparation.

Should you have any questions about the selection of candidate sites for planning proposal preparation or implementation, please contact either Steve Cross of Ecology (206) 459-6675 or Doug Sherwood of EPA (509) 376-9529.

Sincerely,

Paul T. Day
Hanford Project Manager
EPA Region 10

David B. Jansen, P.E.
Hanford Project Manager
Washington State
Department of Ecology

cc: T. Veneziano, WHC

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